A COMPARATIVE STUDY ON THE EFFECTIVENESS OF SCAPULAR PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION TECHNIQUE AND CONVENTIONAL PHYSIOTHERAPY ON PAIN AND DYNAMIC STABILITY OF SCAPULA AMONG SUBJECTS WITH ADHESIVE CAPSULITIS

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A dissertation submitted in the partial fulfillment of the requirement for the degree of **Masters of Physiotherapy- May2019** to The Tamilnadu Dr. M.G.R Medical University, Chennai.

DECLARATION

I hereby declare and present my project work entitled **"A COMPARATIVE STUDY ON "THE EFFECTIVENESS OF SCAPULAR PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION TECHNIQUES AND CONVENTIONAL PHYSIOTHERAPY ON PAIN AND DYNAMIC STABILITY OF SCAPULA AMONG SUBJECTS WITH ADHESIVE CAPSULITIS."** The outcome of the original research work undertaken and carried out by me, under the guidance of **Mrs.Divya J. Pawani. MPT,** Assistant Professor RVS College of Physiotherapy, Sulur, Coimbatore.

I also declare that the material of this project work has not formed in any way the basis for the award of any other degree previously from The Tamil Nadu Dr. M.G.R Medical University.

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INTRODUCTION

Adhesive capsulitis is a common musculoskeletal disorder of shoulder joint caused by inflammation and adhesion formation in the capsule and synovium leading to pain, stiffness, and limited function of the glenohumeral joint. There is global restriction of both passive and active range of motion (ROM) of gleno humeral joint mostly external rotation and abduction of shoulder joint **(Ebenezar,2006).**

Adhesive capsulitis is often more prevalent in women, individuals 40-65 years old, and in the diabetic population, with an occurrence rate of approximately 2-5% in the general population, and 10-20% of the diabetic population. If an individual has adhesive capsulitis they have a 5-34% chance of having it in the contra lateral shoulder at some point. Simultaneous bilateral involvement has been found to occur in approximately 14% of cases. Other associated risk factors include: trauma, prolonged immobilisation, thyroid disease, stroke, myocardial infarcts, and presence of autoimmune disease **(Joshi,2011).**

The condition usually starts with one shoulder and commonly affects the contralateral side years after the onset of symptoms in the first shoulder but it does not affect the same shoulder twice. In 6 to 17% of patients, the other shoulder becomes affected within five years(**Binder,1984).**

The glenohumeral joint is a ball-and socket synovial joint consisting of the shallow glenoid fossa of the scapula and the large, rounded head of the humerus . It contains a joint capsule, a fibrocartilage rim called a labrum, and numerous ligaments. In adhesive capsulitis , there is a lack of synovial fluid, which normally helps the

shoulder joint, a ball and socket joint, move by lubricating the gap between the humerus (upper arm bone) and the socket in the shoulder blade. The shoulder capsule thickens, swells, and tightens due to bands of scar tissue (adhesions) that have formed inside the capsule. As a result, there is less room in the joint for the humerus, making movement of the shoulder stiff and painful. This restricted space between the capsule and ball of the humerus distinguishes adhesive capsulitis from a less complicated, painful, stiff shoulder recurs **(Maheswari,2011).**

There are commonly 3 stages of adhesive capsulitis :

- **Acute/freezing/painful phase**: gradual onset of shoulder pain at rest with sharp pain at extremes of motion, and pain at night with sleep interruption which may last anywhere from 3-9 months.
- **Adhesive/frozen/stiffening phase**: Pain starts to subside, progressive loss of glenohumeral motion in capsular pattern. Pain is apparent only at extremes of movement. This phase may occur at around 4 months and last til about 12 months.
- **Resolution/thawing phase**: Spontaneous, progressive improvement in functional range of motion which can last anywhere from 1 to 2 years **(Ebnezar,2010).**

Two types of adhesive capsulitis, Primary and secondary adhesive capsulitis. **Primary adhesive capsulitis** occurs spontaneously without a specific precipitating event and results from a chronic inflammatory response with fibroblastic proliferation, which is an abnormal response from the immune system. **Secondary adhesive capsulitis** occurs following trauma, shoulder injury or surgery, and may be associated

with other co-morbid condition such as diabetes, rotator cuff injury, cerebro vascular accident (CVA) or cardiovascular disease (**Rizk,1982).**

Typical symptoms includes, patients note a decreased ability to reach behind the back when fastening a garment or removing a wallet from a back trouser pocket. The initial discomfort is described by many patients as a generalized shoulder ache with difficulty pinpointing the exact location of the discomfort. The pain may radiate both proximally and distally, is aggravated by movement and alleviated with rest. Sleep may be interrupted if the patient rolls on the involved shoulder. This condition progresses to one of severe pain accompanied by stiffness and decreased range of motion. The stiffening increases to the point where the natural arm swing that accompanies normal gait is lost. The patient tries to compensate for this loss by using other muscles and increasing scapular rotation to accomplish various activities. This places additional strain on the other muscle groups, leaving them overworked and tender **(Joshi,2011).**

The diagnosis is established based on the symptoms the patient is having. In some cases, magnetic resonance imaging (MRI) or X-rays can help to rule out other potential causes of the pain and stiffness in the shoulder (**Burnham,2017).**

Medical management includes Nonsteroidal anti-inflammatory drugs (NSAIDs) help to relieve pain and inflammation. Analgesics are indicated when NSAIDs are contraindicated. Muscle relaxants are helpful in the early stages of the disease when spasm is predominant. Low-dose antidepressant medications may help to avoid a cycle of sleep disturbance leading to a chronic pain syndrome. Intra-articular corticosteroid injections are used in affected patients to relieve pain and permit a more vigorous physical therapy routine. manipulation of the shoulder under general

anesthesia to break up the adhesions is sometimes used. Surgery to cut the adhesions (capsular release) may be indicated in prolonged and severe cases. . Physical therapy places a major role in treating shoulder pain. Conventional physical therapy treatment includes moist heat, Ultrasound therapy, Interferential therapy, Short-wave diathermy, TENS etc (**Carette,2013).**

The outcome measures commonly used are Numerical pain rating scale and Lateral scapular slide test (LSST)**. Numerical pain rating scale** is the most intensively studied pain measurement tool. It may be applied to measure the pain intensity and pain relief and also can be used to measure the other aspects of pain experience (affective component) **(Hughes 2008).**

The lateral scapular slide test (LSST) developed by Kibler is an indirect method of examining the scapular muscle strength by measuring scapular symmetry in various load positions. LSST is a simple, less time-consuming and clinically approved test to evaluate scapular stability in shoulder rehabilitation protocols. Kibler initially recognised a 1-cm side-to-side difference in scapular positions as being clinically significant. Then he found that in the injured athlete, the side-to-side differences are greater than 0.63 cm, with a range of 0.83 to 1.75 cm. Therefore, for purposes of clinical evaluation, he has established 1.5 cm of asymmetry as the threshold of abnormality and accepted this in any three positions of the test(**Kibler,1998).**

Interferential Therapy Interferential current is the resultant current produced when two or more alternating currents are applied simultaneously at the point of intersection in a given medium (skin) (**Singh, 2012).**

Scapular Proprioceptive neuromuscular facilitation techniques - PNF is an approach to therapeutic exercise that combines functionally based diagonal patterns of movement with techniques of neuromuscular facilitation to improve neuromuscular control, pain and function. Evaluation of the position of the scapula is very important in the pathologies of the shoulder because these pathologies are responsible for the second and third most common causes of musculoskeletal pain. Abnormal changes in the position of the scapula at different angles of the shoulder indicate a disturbance of the scapulohumeral rhythm, and these changes adversely affect the functions of the upper extremity. The ratio of the scapulohumeral rhythm in healthy subjects should be 2:1 (humerus:scapula). In the pathologies limiting the movements of the glenohumeral joint, this rhythm can be reversed. Shoulder pathologies, such as Adhesive capsulitis and subacromial impingement, can lead to changes in the position of the scapula. Even though scapular alterations have been assessed in patients with Adhesive capsulitis shoulder. PNF has been reported to be effective in relieving pain and improving functional abilities. Among therapeutic approaches, joint mobilization using PNF has a positive effect on pain, muscle strength, and Dynamic stability. Proper function of the upper extremities requires both motion and stability of the scapula. However, no previous study has investigated the effects of scapular PNF exercises in Adhesive capsulitis of shoulder rehabilitation. Therefore, the aim of this study was to compare the initial effects of scapular PNF techniques with physiotherapy modalities on pain, scapular alignment and functionality in patients with Adhesive Capsulitis of shoulder. (**Hindle *et al* ., 2012)**

The **rhythmic initiation technique** is the best facilitation technique for scapula. This technique teaches the motion, helps the patient to relax, improves coordination, and normalizes the motion. In this technique, the scapula is taken

passively and rhythmically in two diagonals, anterior elevation and posterior depression and posterior elevation and anterior depression. Then move on to active assisted scapular movements. And progression is made to resisted movement. Finally encourage the patient to maintain free active movement. Here we needs only resisted exercises in order to improve the stability of scapula. **(Gardiner, 2003).**

1.1 Statement of study

A Comparative study on the effectiveness of scapular PNF technique and conventional physiotherapy on pain and Dynamic scapular stability among subjects with adhesive capsulitis

1.2 Need of the study

Adhesive capsulitis is a musculoskeletal condition that has a disabling capability. It affects 2 to 5% of general population. Patients with adhesive capsulitis suffer with pain and long-term ROM deficits. Scapular PNF technique with Interferential therapy shown significant result in reduction of pain and Dynamic scapular stability and functional activities in subjects with adhesive capsulitis.

1.3 Objectives of the study

- To find out the effectiveness of scapular PNF technique in the management of pain among the adhesive capsulitis patients.
- To find out the effectiveness of scapular PNF technique on Dynamic scapular stability among the adhesive capsulitis patients
- To find out the effectiveness of conventional physiotherapy in the management of pain among the adhesive capsulitis patients.

- To find out the effectiveness of conventional physiotherapy on Dynamic scapular stability among the adhesive capsulitis patients
- To compare the effectiveness of Scapular PNF technique, conventional physiotherapy in the management of pain among the adhesive capsulitis patients.
- To compare the effectiveness of Scapular PNF technique, conventional physiotherapy on Dynamic scapular stability among the adhesive capsulitis patients.

1.4 Hypothesis

1. It is hypothesized that there is no significant differences in pain and Dynamic scapular stability following scapular PNF technique among adhesive capsulitis patients.
2. It is hypothesized that there is no significant difference in pain and Dynamic scapular stability following Conventional Physiotherapy among adhesive capsulitis patients.
3. It is hypothesized that there is significant difference in pain and dynamic scapular stability among Adhesive capsulitis patients treated with scapular PNF technique When compared to Conventional Physiotherapy.

1.5 Operatonal Definitions

Adhesive capsulitis

Adhesive capsulitis is a syndrome which is characterized by global restriction of both passive and active range of motion (ROM) of gleno humeral joint with

external rotation usually being most restricted and spontaneous recovery of pain and improvement in functional activities over months to years**(Bulgen,1984).**

Pain

Pain is an unpleasant and emotional experience associated with or without actual tissue damage. Pain may be Acute or Chronic. Acute pain is a sharp pain of short duration with easily identified cause. Often it is localized in a small area. Chronic pain is the intermittent or constant pain with different intensities. It lasts for longer periods and is somewhat difficult to treat **(Sembulingam., 2012).**

Dynamic Scapular Stability

The ability to position and control movements of the scapula during upper limb function. The inability to achieve this stable base frequently accompanies the development of shoulder and upper limb pain and pathology. **(Lewis., 2003)**

Interferential Therapy

Interferential current is the resultant current produced when two alternating medium frequency currents are applied simultaneously at the point of intersection in a given medium (skin) **(Singh., 2012).**

The lateral scapular slide test (LSST)

Developed by Kibler is an indirect method of examining the scapular muscle strength by measuring scapular symmetry in various load positions. LSST is a simple, less time-consuming and clinically approved test to evaluate scapular stability in shoulder rehabilitation protocols. Kibler initially recognised a 1-cm side-to-side difference in scapular positions as being clinically significant. Then he found that in the injured athlete, the side-to-side differences are greater than 0.63 cm, with a range

of 0.83 to 1.75 cm. Therefore, for purposes of clinical evaluation, he has established 1.5 cm of asymmetry as the threshold of abnormality and accepted this in any three positions of the test **(Kibler., 1998).**

Numerical pain rating scale (NPRS)

Measures the subjective intensity of pain. It is an 11 point scale from 0 - 10. Patients verbally select a value that is most in line with the intensity of pain that they have experienced in the last 24 hours. The NPRS has good sensitivity while producing data that can be statistically analysed **(Williamson & Hogger., 2005)**

II REVIEW OF LITERATURE

Section A : Studies on the general aspect of adhesive capsulitis of shoulder joint.

Section B: Studies on the effect of Interferential therapy (IFT) in adhesive capsulitis of shoulder

Section C: Studies on the effect of proprioceptive neuromuscular facilitation technique in adhesive capsulitis of shoulder joint

Section D: Studies on the effect of exercises on Adhesive capsulitis shoulder

Section E : Studies on reliability and validity of Numerical pain rating scale

Section F: Studies on reliability and validity of lateral scapular slide test

Section A : Studies on the general aspect of adhesive capsulitis of shoulder joint.

Mezia *et al*., (2014) did study on patients with adhesive capsulitis (AC), is also known as frozen shoulder an insidious painful condition of the shoulder persisting more than 3 months. This inflammatory condition that causes fibrosis of the glenohumeral joint capsule is accompanied by gradually progressive stiffness and significant restriction of range of motion (typically external rotation). However, the patients may develop symptoms suddenly and have a slow recovery phase. The recovery is satisfying in most of the cases, even though this may take up to 2 to 3 years. Functional impairments caused by Adhesive capsulitis shoulder consist of limited reaching, particularly during overhead (e.g., hanging clothes) or to-the-side (e.g., fasten one's seat belt) activities. Patients also suffer from restricted shoulder rotations, resulting in difficulties in personal hygiene, clothing and brushing their hair. patients with Adhesive capsulitis shoulder usually demonstrate significant restriction

in active and passive range of motion, particularly in external rotation and abduction movement. The majority of treatment options for Adhesive Capsulitis are non-operative and include pharmacological management and physical therapy.

Paul *et al*., (2014) - Physiotherapy treatment of Adhesive capsulitis shoulder is varied, but most lack specific focus on the underlying disorder, which is the adhered shoulder capsule. Although positive effects were found after physiotherapy, the recurrence and prolonged disability of Adhesive capsulitis are major factors to focus on to provide the appropriate treatment. A total of 100 participants were randomly assigned to an experimental group and a control group, with each group having 50 participants. The control group received physiotherapy and the experimental group received countertraction and physiotherapy. The total treatment time was 20 minutes a day for 5 days per week for 2 weeks. The outcome measures used were goniometer measurements, VAS, and the Oxford Shoulder Score Incorporating shoulder countertraction along with physiotherapy improves shoulder function compared with physiotherapy alone for the treatment of a Adhesive capsulitis shoulder.

Jane *et al*., (2014) - Therapeutic exercises and mobilization are strongly recommended for reducing pain, improving range of motion (ROM) and function in patients with stages 2 and 3 of Adhesive capsulitis shoulder. Low-level laser therapy is strongly suggested for pain relief and moderately suggested for improving function but not recommended for improving Range Of Motion. Corticosteroid injections can be used for stage 1 Adhesive capsulitis shoulder. Electro- therapy can help in providing short-term pain relief. Deep heat can be used for pain relief and improving

Range Of Motion. Ultrasound for pain relief, improving Range Of Motion or function is not recommended.

Boucher *et al*., (2011) - Decreased active and passive range of motion (ROM) accompanied by pain in the shoulder is a common presentation for patients with Adhesive capsulitis shoulder, and it can be difficult to restore normal function. Through the fascial distortion model, physicians can apply a manual technique to rapidly and effectively increase Range Of Motion and decrease pain. A 28-year-old man presented 18 months after sustaining a shoulder hyperextension injury. On active and passive Range Of Motion examination, he had approximately 90° of shoulder abduction and moderately reduced internal rotation associated with 8/10 pain. After 2 applications of the fascial distortion model, his shoulder restored to full abduction and internal rotation with no pain.

Angelis *et al*., (2009) - Patients commonly present with shoulder complaints to the primary care and orthopaedic setting. Despite the prevalence of adhesive capsulitis, it is commonly misdiagnosed and management remains unclear. This article reviews the presentation of adhesive capsulitis, presents an overview of the pathophysiology of this poorly understood disease, and evaluates non operative treatment options for adhesive capsulitis

Section B: Studies on the effect of Interferential therapy (IFT) in adhesive capsulitis of shoulder

Correa *et al.,* (2013) did a study on150 participants for 4 months after randomization. He divided into three groups: 1 kHz, 4 kHz and placebo. There was a significant decrease in pain intensity in the active groups. He concluded that there was a significant increase in pressure pain thresholds in both active groups compared to

the placebo group and a reduction in the temporal summation in the 1 kHz group compared to the other groups. The interferential therapy (IFT) presented advantages in the physiological measures of pain and showed decrease frequency use of pain.

Paul *et al., (*2012). A total of 100 participants were randomly assigned to an experimental group and a control group, with each group having 50 participants. The control group received physiotherapy and the experimental group received Interferential current and physiotherapy. The total treatment time was 20 minutes a day for 5 days per week for 2 weeks. The outcome measures are VAS, and the Oxford Shoulder Score. Incorporating Interferential therapy along with physiotherapy improves shoulder function compared with physiotherapy alone for the treatment of a Adhesive capsulitis shoulder.

Celik *et al*., (2010) did a study on 50 aged patients with Adhesive capsulitis of shoulder. They were randomly divided into two groups: IFC (gr. I) and TENS (gr. II). Depending on the groups, patients were given series of ten 20-minute sessions using either IFT or TENS currents. He concluded that there was no statistically significant difference between the TENS and IF groups in reducing the intensity and other aspects of pain (frequency, pain medication and activity limitation) under the influence of therapy.Interferential current and TENS therapy are effective for pain relief in patients with Adhesive capsulitis of shoulder. The study showed equal analgesic efficacy of both treatments.

Evan *et al.,* (2009) conducted a study with 80 patients with Adhesive capsulitis shoulder and completed 6 sessions of Interferential therapy and stretching exercises twice weekly for 3 weeks. Patient outcome was classified at the end of treatment based on the perceived recovery. He concluded that patients with Adhesive

capsulitis shoulder had dramatic improvement with Interferential therapy and stretching exercises.

Bertoft *et al*., (1999) did a study to compare the effect of enhanced versus limited Therapeutic Alliance on pain intensity and muscle pain sensitivity in patients with Shoulder pain receiving active interferential current therapy (IFC). 117 participants were randomly divided into 4 groups. He concluded that IFC appears to lead to clinically meaningful improvements in outcomes when treating patients with Persistant Shoulder Pain.

Section C: Studies on the effect of scapular PNF techniques in adhesive capsulitis of shoulder

Gulsen *et al*., (2016) The aim of our study was to compare the initial effects of scapular proprioceptive neuromuscular facilitation techniques and classic exercise interventions with physiotherapy modalities on pain, scapular position , range of motion, and function in adhesive capsulitis. Fifty-three subjects were allocated to 3 groups: scapular proprioceptive neuromuscular facilitation exercise and physiotherapy modalities, classic exercise and physiotherapy modalities, and only physiotherapy modalities. The intervention was applied in 3 - 4 sessions in one week. The patients were treated for 4 weeks. The Visual Analog Scale, Lateral Scapular Slide Test, range of motion were evaluated before and just after the one-hour intervention in the same session. All of the groups showed significant differences in shoulder flexion and abduction range of motion. There were statistically significant differences in Visual Analog Scale scores in the proprioceptive neuromuscular facilitation and control groups. Proprioceptive neuromuscular facilitation, classic exercise, and physiotherapy modalities had immediate effects on adhesive capsulitis in our study. An effective

treatment regimen for shoulder rehabilitation of adhesive capsulitis patients should include scapular exercises.

Park *et al*.,(2013) - The present study examined the effects of treatment using PNF extension techniques on the pain, pressure pain, and neck and shoulder functions of the upper trapezius muscles of myofascial pain syndrome (MPS) patients. Thirty-two patients with MPS in the upper trapezius muscle were divided into two groups: a PNF group (n=16), and a control group (n=16). The PNF group received upper trapezius muscle relaxation therapy and shoulder joint stabilizing exercises.. Subjects in the control group received only the general physical therapies for the upper trapezius muscles. Conducted 6 sessions, twice weekly. Total treatment for 3 weeks Subjects were measured for pain on a visual analog scale (VAS), pressure pain threshold (PPT), the neck disability index (NDI), Exercise programs that apply PNF techniques can be said to be effective at improving the function of MPS patients.

Alaca *et al*., (2011) - The aim of this longitudinal study was to examine the long term functional effectiveness of proprioceptive neuromuscular facilitation (PNF) in shoulder pain patients. We included 30 patients and they were randomly assigned to two groups. In addition to the standard rehabilitation program the PNF group received proprioceptive neuromuscular facilitation techniques in all patterns 10 repetitions and the rest period is 10 seconds and the other group received shoulder exercises. 12 sessions over a 4 weeks of treatment. The outcome measures included pain scores using a numeric pain rating scale, There were no significant differences between the two groups in terms of baseline demographic data, clinical findings and length of stay. Administration of PNF resulted in earlier functional gains in patients with shoulder syndrome. PNF techniques can positively affect functional outcomes over the long term.

Oledzka *et al.,* (2010) Subacromial impingement syndrome is a condition of the shoulder girdle which limits daily activities. It is worth seeking fast and effective treatment options. The aim of this study was to assess the impact of scapular proprioceptive neuromuscular facilitation (PNF) therapy on the shoulder range of motion and pain level in patients with subacromial impingement syndrome. The experimental group consisted of 11 patients with subacromial impingement syndrome who had undergone therapy based on the PNF concept. A control group consisted of 12 patients with subacromial impingement syndrome who had undergone laser therapy, and local cryotherapy. Patients also evaluated their pain levels and Lateral scapular slide test Nonparametric tests were used for the statistical analysis. after 12 sessions in 4 weeks of PNF therapy, the pain reduced and there is difference in the alignment of scapula.

Section D: Studies on the effect of exercises on Adhesive capsulitis shoulder

Reilly et al., *(*2012) investigated the effect of a intensity exercise program in patients with Adhesive capsulitis shoulder) conducted a multicenter randomized trial with 110 carefully selected subjects,10 repetitions of each exercise, twice daily over a four week period This program resulted in improvements in pain scores and physical function scores after exercise program. The control groups received no intervention. These programs resulted in improved function and decreased pain relative to a group that received health education information only.

American Academy of Orthopedic surgeons (2010) The physical therapy exercises for treatment of frozen shoulder shoulder included External rotation with passive stretch hold for 30 sec, Forward flexion with supine position hold for 15 sec, Crossover arm stretch hold for 30sec..Each stretch is repeated for 15 times per day,

the total treatment programme for 4 weeks. Results in reduction of pain and improved function.

Manske, *et al.,* (2008) conducted a study on Diagnosis and management of adhesive capsulitis. They used physical therapy Active stretching for 77 patients .Hold the stretch for 15 to 20 seconds, 10 to 20 times per day in a 6 week treatment programme. Outcome measures used in the study are Pain, ROM and Function. They assumed that 90% of patients reported successful outcomes. 10% were not satisfied.

Stenstrom *et al., (*2007) evaluated home exercise program in the management of patients with shoulder pain. In this case the program lasted for 6 weeks and was followed up after an additional 4 weeks. Relatively short durations of exercise (15 minutes per day) appear to result in significant improvements in pain and function

Lewis *et al*., (2005) This study was designed to investigate whether post-exercise analgesia occurs following an ad lib exercise routine. All of the 17 male participants exercised on a regular basis. In an exercise setting (student gymnasium) they participated in 20 min of self-selected exercise, they rested quietly for 20 min. Pain was induced via the gross pressure device. Pain threshold and pain tolerance were measured twice, with an interval of 20 min, in both the exercise and the neutral setting. Pain threshold was stable in the exercise setting. A significant increase in pain tolerance followed the 20 min bout of exercise, indicating a post-exercise analgesic response. These results support the prediction that the analgesic effect of exercise is not limited to controlled experimental conditions, but generalizes to naturally occurring situations.

Section E: Studies on reliability and validity of Numerical pain rating scale (NPRS)

Fadaizadeh *et al.,* (2009) conducted this study to compare the accuracy of two most commonly used tools for evaluation of pain intensity in a group of postoperative Iranian patients. All postoperative patients admitted to the surgical wards of Masih Daneshvari and RasoulAkram Hospitals, Tehran, Iran were studied. During a two-month period, patients were evaluated for pain intensity within 24 hours of operation. Numerical pain rating scale and faces rating scale were used for this purpose. Eighty- two patients were enrolled into the study. Forty-eight patients underwent obstetrics and 34 had general surgeries. Using Spearman analysis, we found a linear correlation between the results of the two methods (P=0.952). Using multivariate analysis, we found that none of the variables such as age, gender, and education level had significant effects on correlation between visual analogue scale and faces rating scale. Numerical pain rating scale and faces rating scale are two pain assessment tools that can be used interchangeably for evaluation of acute postoperative pain.

Boonstra *et al.,* (2008) conducted a study consisting of patients over 18 years of age, suffering from chronic musculoskeletal pain; 52 patients in the reliability study, 344 patients in the validity study. Main outcome measures were, NPRS pain scores with Roland-Morris Disability Questionnaire scores were from 0.33 to 0.43 and NPRS pain scores from 0.76 to 0.84. The conclusion of the study was that the reliability of the NPRS for disability is moderate good in chronic low back pain patients.

Bosch *et al.,* (1989) did a study on 212 patients with duration of 24 hours and concluded that a. Numerical pain rating scale is useful in the measurement of post operative pain in usual medical practice. Also found that NPRS is a reliable method to assess pain in clinical setting.

Cormack *et al.,* (1988) suggested that. Numerical pain rating scale (NPRS) provide a simple technique for measuring subjective experience. It has been established as valid and reliable in a range of clinical and research applications, although there is also evidence of increased error and decreased sensitivity when used some subject groups. Decisions concerned with the choice of scoring interval, experimental design, and statistical analysis for NPRS have in some instances been based on convention, assumption and convenience, highlighting the need for more comprehensive assessment of individual scales if this versatile and sensitive measurement technique is to be used to full advantage.

Carlson *et al.,* (1983) the Numerical pain rating scale (NPRS) is a simple and frequently used method for the assessment of variations in intensity of pain. In clinical practice, the percentage of pain relief, assessed by NPRS, is often considered as a measure of the efficacy of treatment.

Section F.: studies on the reliability and validity of lateral scapular slide test

Park *et al.,* (2016) The purpose of the present study was to examine the intra rater reliability and inter rater reliability of lateral scapular slide tests among young females. A total of 60 female students in U University in Gyeongsangbuk-do, South Korea participated in this study. Lateral scapular slide tests (LSST) were conducted to identify inter rater & intra rater reliability. In the LSSTs, the distance from the inferior

angle of the scapula to thoracic vertebral spinous process T8 was measured in three positions (shoulder joint 0°, 45°, and 90° abduction) using tape measures. Intra rater reliability is shown to be moderate with scores not lower than 0.7 in left positions 1 and 3 and is shown to be excellent with scores not lower than 0.9 in the remaining positions. Inter rater reliability is shown to be excellent with scores not lower than 0.9 in all three left and right positions. LSST is sufficiently high to be accepted as an objective tool in the results of general previous studies. In addition, it can be considered useful at clinics because the measuring tool and method are simple.

Odom *et al.*, (2014) The Lateral Scapular Slide Test (LSST) is used to determine scapular position with the arm abducted 0, 45, and 90 degrees in the coronal plane. Assessment of scapular position is based on the derived difference measurement of bilateral scapular distances. The purpose of this study was to assess the reliability of measurements obtained using the LSST and whether they could be used to identify people with and without shoulder impairments. Subjects. Forty-six subjects ranging in age from 18 to 65 years participated in this study. One group consisted of 20 subjects being treated for shoulder impairments, and one group consisted of 26 subjects without shoulder impairments. Our results suggest that measurements of scapular positioning based on the difference in side-to-side scapular distance measures are not reliable. Furthermore, the results suggest that sensitivity and specificity of the LSST measurements are poor and that the LSST should not be used to identify people with and without shoulder dysfunction.

Kibler *et al.*, (2003) The lateral scapular slide test (LSST) developed by Kibler is an indirect method of examining the scapular muscle strength by measuring scapular symmetry in various load positions. LSST is a simple, less time-consuming and clinically approved test to evaluate scapular stability in shoulder rehabilitation

protocols. Kibler initially recognised a 1-cm side-to-side difference in scapular positions as being clinically significant. Then he found that in the injured athlete, the side-to-side differences are greater than 0.63 cm, with a range of 0.83 to 1.75 cm. Therefore, for purposes of clinical evaluation, he has established 1.5 cm of asymmetry as the threshold of abnormality and accepted this in any three positions of the test. Some studies used tape measure, but others used string to measure the reliability of LSST. Previous studies on the reliability and validity of the LSST have shown conflicting results.

Shadmehr *et al.,* (2001) - The reliability of lateral scapular slide test (LSST) at 90 degrees of abduction is controversial; therefore, in order to achieve more reliability it may be necessary to make changes in this particular position. Modified lateral scapular slide test (MLSST) was done on thirty male basketball players with two examiners in one session and for the retest with one examiner in the next week. The test was done in 7 positions: arm relaxed at the side (P1), 90 degrees of abduction (P2), 90 degrees of scaption without having a weight in hands (P3), 90 degrees of scaption with having 3 different weights (1, 2, and 4 kg) in hands (P4, P5, and P6, resp.), and 180 degrees of scaption without having a weight in hands (P7). The maximum and minimum inter rater reliability were P1 and P4, respectively. Scaption with loading, as a functional position in the overhead athletes, is a reliable positioning and may be replaced with the third position of the traditional LSST.

Nijs *et al*., (2000) - Study participants filled in a visual analog scale for pain and the Shoulder Disability Questionnaire. 2 assessors performed the following tests: measurement of the distance between the posterior border of the acromion and, measurement of the distance from the medial scapular border to the fourth thoracic spinous processes, and the lateral scapular slide test. The inter

observer reliability coefficients were greater than .88 (intra class correlation coefficients) for the measurement of the distance between the posterior border of the acromion and the table, were greater than .50 for the measurement of the distance from the medial scapular border to the fourth thoracic spinous processes, and were greater than .70 for the lateral scapular slide test.

III METHODOLOGY

3.1 Study setting

The study was conducted in Physiotherapy outpatient department, RVS College of Physiotherapy, Sulur, Coimbatore.

3.2 Selection of subjects

20 clinically diagnosed adhesive capsulitis subjects were selected for the study who fulfilled the inclusion and exclusion criteria and were divided into two groups.

Group A- Scapular proprioceptive neuromuscular facilitation techniques along with Conventional Physiotherapy (IFT)

Group B - Conventional physiotherapy(IFT) with exercises

Subjects of both the group were assessed for pain on Numerical Pain Rating scale and Dynamic Scapular stability by using Lateral scapular slide test.

3.3 Variables

3.3.1 Dependent variable

- Pain
- Dynamic scapular stability

3.3.2 Independent variables

- Scapular PNF technique along with conventional physiotherapy
- Conventional Physiotherapy with Exercises

3.4 Measurement tools

Variables	Tools
Pain	Numerical Pain Rating Scale (NPRS)
Dynamic Scapular stability	Lateral scapular slide test (LSST)

3.5 Study design

The study design adopted was pretest and posttest, experimental design

3.6 Inclusion Criteria

- Clinically diagnosed Adhesive capsulitis Patients.
- Age group between 50-60years.
- Both male and female.
- Pain in the shoulder for at least 3 months.
- Patients who are cooperative.
- Patients who are willing to participate.

3.7 Exclusion Criteria

- History of shoulder surgery or manipulation under anesthesia
- Neurologic deficits affecting shoulder functioning during daily activities
- Pain or disorders of the cervical spine, elbow, wrist, or hand
- Other pathological conditions involving the shoulder (rotator cuff tear, tendinitis, etc.)
- Post stroke, hemiplegic shoulder.
- Bilateral adhesive capsulitis shoulder
- Recent cases of fracture and dislocation in the ipsilateral upper limb

- Infective arthritic conditions of shoulder.
- Severe swelling around the shoulder.
- Infection and/or skin lesions at the site of the application of the interferential current
- Cancer
- Cardiac pacemaker
- Allergy in the region of electrode placement

3.8 Orientation to the subjects

Before collection of data all the subjects were explained about the purpose of the study. The investigator had given a detailed orientation about various test procedures such as Lateral scapular slide test to assess Dynamic scapular stability which affect the shoulder function. The concern and full cooperation of each participant was sought after complete explanation of the condition and demonstration of the procedure involved in the study.

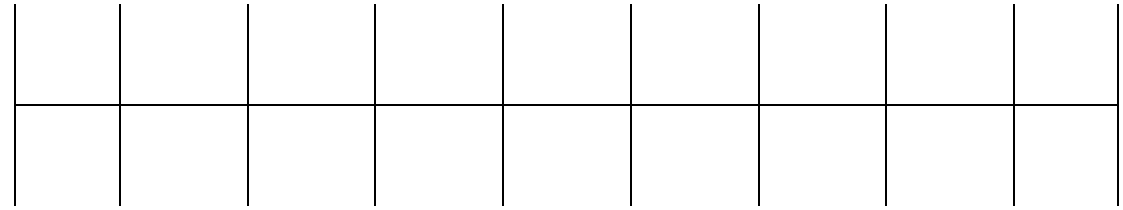
3.9 Materials used

- Client consent form
- Patient Consent form
- IFT Equipment
- Couch
- Pillow
- Bed spread or towel
- Inch tape

3.10 Test Administration

a) Pain assessment by Numerical pain rating scale (NPRS)

Measures the subjective intensity of pain. It is an 11 point scale from 0 - 10. Patients verbally select a value that is most in line with the intensity of pain that they have experienced in the last 24 hours. The NPRS has good sensitivity while producing data that can be statistically analysed.



1 2 3 4 5 6 7 8 9

10

No pain Worst pain

b) Lateral scapular slide test (LSST) to assess Dynamic Scapular stability

The lateral scapular slide test (LSST) developed by Kibler in 2003 is an indirect method of examining the scapular muscle strength by measuring scapular stability in various load positions The examiners measured the distance from the T7 spinous process to inferior angle of scapula in all three arm positions; this linear distance was defined as the scapular index.

- The first position was of the arm relaxed at the sides (0° of shoulder abduction).
- The second was the subject's hand around the waist with the web space between the thumb and second finger placed on the lateral iliac crest (45° of shoulder abduction);
- The third was with the arm abducted at 90° and in full internal rotation.

3.11 Treatment procedure

On first visit after getting consent form assessing the patient before the treatment begins. In our project we have assigned the treatment protocol for 4 weeks.

Therapeutic IFT

Patient is in sitting position. 4 electrodes are applied over the area of affected shoulder, so that the point of intersection of each current fell down on the point where pain perceived. The pulse duration was 200-300ms. Amplitude-modulated frequency (AMF) =100Hz. The physical therapist will be responsible for increasing the amplitude of the current until the participant reports feeling a "strong but comfortable tingling" is maintained. In the case of decreased sensation, the amplitude of the current will be increased until the participant reaches the previous feeling. The treatment time is 15 minutes. The amplitude can be maintained until the contraction is visible. Sessions /day - 1 session

Figure 1 : Shows Interferential therapy for Shoulder

SCAPULAR PNF TECHNIQUE – RHYTHMIC INITIATION

A) Anterior Elevation Posterior Depression

- **Patient position :** Patient lie on the unaffected side

  .

- **Therapist Position :** Standing behind the patient, placing one hand superior border of scapula and other on inferior angle of scapula

- **Procedure:** The patient is instructed to Push up and Push down the scapula against the manual resistance given by therapist.

  Repetitions : 5 repetitions Hold time : 5 seconds

  Rest time : 2 seconds Session/Day : 3 times

Figure 2 : shows Anterior Elevation and Posterior Depression

B) Posterior Elevation Anterior Depression

- **Patient position** **:** Patient lie on the unaffected side.
- **Therapist Position** **:** Standing behind the patient, placing one hand superior border of scapula and other on inferior angle of scapula
- **Procedure** **:** The patient is instructed to Push back and Push front the scapula against the manual resistance given by therapist .

Repetitions	: 5 repetitions	Hold time	: 5 seconds
Rest time	: 2 seconds	Session/Day	: 3 times

Figure 3 : Shows Posterior Elevation and Anterior Depression

EXERCISES

Table 1

Sl no;	Exercise	Patient position & Therapist position	Procedure	Photo
1.	**Protraction**	Patient : standing Therapist : standing near to patient	Patient moves the shoulder blades forward Repetitions : 10times Hold time : 5 sec Rest time : 2 sec session/day : 3 times	
2.	**Retraction**	Patient : standing Therapist : standing near to patient	Patient moves the shoulder blades Backward Repetitions : 10times Hold time : 5 sec Rest time : 2 sec session/day : 3 times	

Sl no;	Exercise	Patient position & Therapist position	Procedure	Photo
3.	**Elevation**	Patient : standing Therapist : standing near to patient	Patient moves the shoulder blades Upwards Repetitions : 10times Hold time : 5 sec Rest time : 2 sec session/day : 3 times	
4.	**Depression**	Patient : standing Therapist : standing near to patient	Patient moves the shoulder blades Downwards Repetitions : 10times Hold time : 5 sec Rest time : 2 sec session/day : 3 times	

Sl no;	Exercise	Patient position & Therapist position	Procedure	Photo
5.	**Inferior capsular stretch**	Patient : Standing Therapist : standing near to patient	Patient raise the involved arm over and behind head, elbow bent. Grasp elbow of involved arm with uninvolved arm , pull gently until a stretch is felt. Repetitions : 5 times Hold time :15 sec Rest time : 2 sec session/day : 3 times	
6.	**Anterior capsular stretch**	Patient : stand back to the couch with reachable distance in walk standing position, Therapist : standing near to patient	Patient has to Grasp the hand on the window bar by extending the shoulder , patient lunge forward and down until feels stretch. Repetitions : 5 times Hold time :15 sec Rest time : 2 sec session/day: 3 times	

Sl no;	Exercise	Patient position & Therapist position	Procedure	Photo
7.	**Pendulum (Codman's)exercise**	Patient: stands with the trunk flexed, hip at 90 degrees. The arm hangs loosely downwards. Therapist : standing near to patient	patient moves the trunk slightly back and forth, to initiate the pendulum or swinging motion. Flexion, extension, horizontal abduction, adduction and circumduction can be done. time : 3 - 5 minutes session/day : 3 times	
8.	**Wall climbing exercise**	Patient : stand face to the wall. Therapist : standing near to patient	Patient standing one arm distance to the wall, fingers can just touch it. walk the fingers of y injured arm up the wall as high untill feel stretch. then. Slowly walk your fingers back down to the starting position. Repetitions : 10 times Hold time :15 sec Rest time : 2 sec session/day: 3 times	

3.12 Collection of data

Twenty clinically diagnosed Adhesive capsulitis subjects aged between 50 - 60 years who fulfilled the inclusion and exclusion criteria and were divided into two groups.

Group A - Scapular proprioceptive neuromuscular facilitation (PNF) technique with Conventional Physiotherapy

Group B - conventional Physiotherapy with exercises

Both the group was given treatment for 4 weeks. Before and after 4 weeks of treatment intervention, Dynamic Scapular stability and pain was evaluated by Lateral scapular slide test and NPRS and values were recorded.

3.13 Statistical techniques

The collected data were analyzed by paired ‘t’ test to find the significance difference between pre and post-test values of experimental group and further unpaired ‘t’ test was applied to find out the difference between groups.

IV DATA ANALYSIS AND RESULTS

4.1 Data analysis

The chapter deals with systematic presentation of the analyzed data followed by the interpretation of the data.

Paired‘t’ test was used as a parametric test to find the intra group significance.

Unpaired‘t’ test was used as a parametric test to find the inter group significance.

a) Paired ‘t’ tests

$$\bar{d} = \frac{\sum d}{n}$$

$$s = \sqrt{\frac{\sum d^2 - (\sum d)^2 / n}{n - 1}}$$

$$t = \frac{\bar{d}\sqrt{n}}{s}$$

Where,

d – Difference between pre-test and posttest values

$\bar{d} = \frac{\sum d}{n}$ – Mean of difference between pretest and posttest values

n – Total number of subjects

s – Standard deviation

b) Un paired‘t’ test

$$s = \sqrt{\frac{\sum(x_{1-}\bar{x}_2)^2 + \sum(x_{2-}\bar{x}_2)^2}{n_1 + n_2 - 2}}$$

$$t = \frac{\bar{x}_{1-}\bar{x}_2}{S}\sqrt{\frac{n_1 n_2}{n_1 + n_2}}$$

Where,

S = Standard deviation

n_1= Number of subjects in Group A

n_2= Number of subjects in Group B

x_1= Mean of the difference in values between pre-test and post-test in Group-A

x_2= Mean of the difference in values between pre-test and post-test in Group-B

Table: 2

The table shows mean value, mean difference, standard deviation and paired 't' value between pre and post-test values of pain among Group A.

Measurement	Mean	Mean difference	Standard deviation	Paired 't' value
Pre test	7.1	4.3	0.81	16.76*
Post test	2.8			

*0.005 level of significance

The calculated 't' value is 16.76 and 't' table value is 3.250 at 0.005 level of significance. Since the calculated 't' value is more than the 't' table value, it concludes that there is significant difference in pain following scapular PNF techniques along with conventional physiotherapy among subjects with adhesive capsulitis .

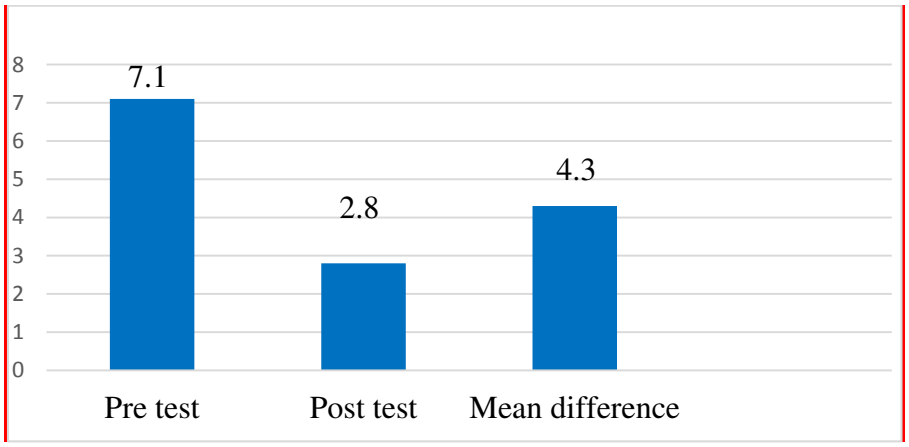


Figure 4: Graphical presentation of pre-test and post-test mean value of pain among Group A.

Table: 3

Mean value, mean difference, standard deviation and paired‘t’ value between pre and posttest values of pain among Group B.

Measurement	Mean	Mean difference	Standard deviation	Paired ‘t’ value
Pre test	7.6	2.8	0.91	9.71*
Post test	4.8			

*0.005 level of significance

The calculated ‘t’ value is 9.71 and the ‘t’ table value is 3.250 at 0.005 level of significance. Since the calculated ‘t’ value is more than ‘t’ table value, it shows that there is significant difference in pain following conventional physiotherapy with exercises among subjects with adhesive capsulitis.

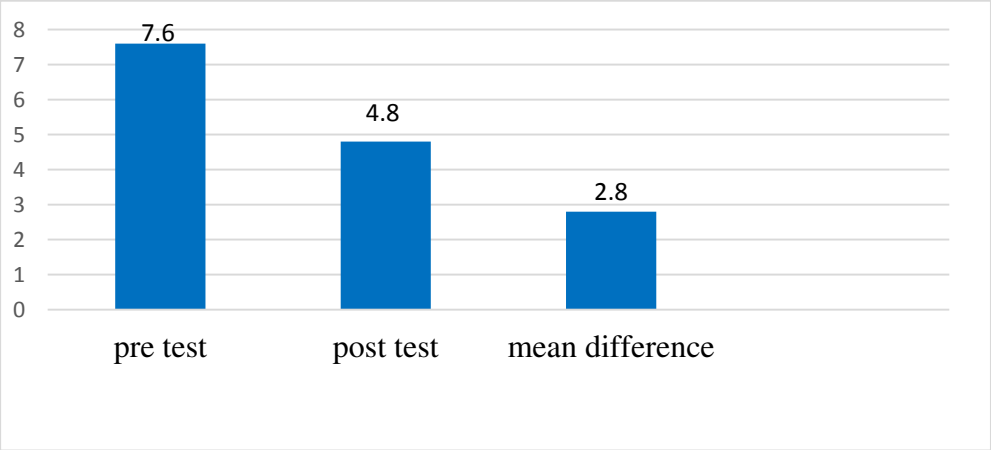


Figure 5: Graphical representation of pre-test and post-test mean value of pain among Group B

Table: 4

The table shows the mean value, mean difference, standard deviation and unpaired 't' value of pain between Group A and Group B

Sl. No	Groups	Improvement		Standard deviation	Un paired 't' test
		Mean	Mean Difference		
1	Group-A	4.3	1.5	0.87	3.83*
2	Group-B	2.8			

*0.005 level of significance

The calculated 't' value is 3.83 and the 't' table value is 2.878 at 0.005 level of significance. Since the calculated 't' value is more than 't' table value, it shows that there is significant difference between scapular PNF techniques along with conventional physiotherapy and conventional physiotherapy with exercises in the management of pain among subjects with adhesive capsulitis .

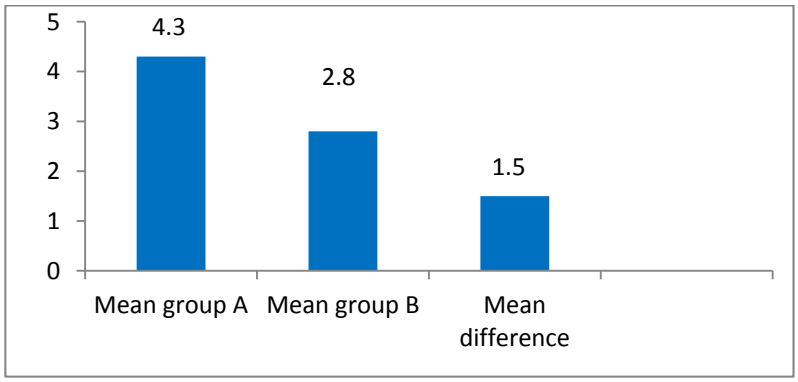


Figure 6: Graphical graphic presentation of pre-test and post-test mean value of pain in Group A and Group B

Table: 5

The table shows mean value, mean difference, standard deviation and paired‘t’ value between pre and post-test values of Dynamic scapular stability among Group A.

Measurement	Mean		Mean difference	Standard deviation	Paired ‘t’ value
Pre test	P1	14.9			
	P2	16	1.9	0.40	11.08
	P3	16.5			
Post test	P1	13	1	0.38	9.11
	P2	15			
	P3	15	1.5	0.49	10.38

*0.005 level of significance

The calculated ‘t’ value of position 1 , 2 and 3 are 11.08, 9.11 , and 10.38 respectively and ‘t’ table value is 3.250 at 0.005 level of significance. Since the calculated ‘t’ values are more than the ‘t’ table value, it concludes that there is significant difference in dynamic scapular stability following scapular PNF techniques along with conventional physiotherapy among subjects with adhesive capsulitis

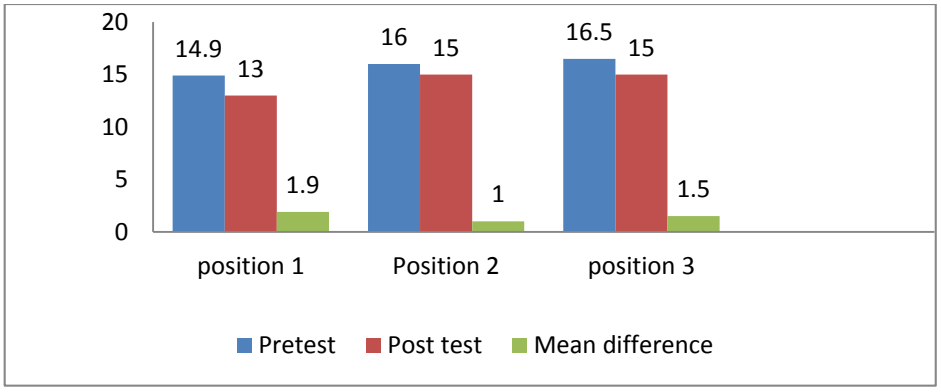


Figure 7: Graphical Presentation of pre-test and Post- test mean value of Dynamic scapular stability in all 3 positions among group A

Table 6

Mean value, mean difference, standard deviation and paired 't' value between pre and posttest values of Dynamic scapular stability among Group B.

Measurement	Mean		Mean difference	Standard deviation	Paired 't' value
Pre test	P1	15.5			
	P2	15	0.5	0.49	9.05
	P3	14.7			
Post test	P1	15	0.5	0.58	10.08
	P2	14.5			
	P3	14.4	0.3	0.28	8.05

*0.005 level of significance

The calculated 't' value of position 1 , 2 and 3 are 9.05, 10.08 , and 8.05 respectively and 't' table value is 3.250 at 0.005 level of significance. Since the calculated 't' values are more than the 't' table value, it concludes that there is significant difference in dynamic scapular stability following conventional physiotherapy with exercises among subjects with adhesive capsulitis

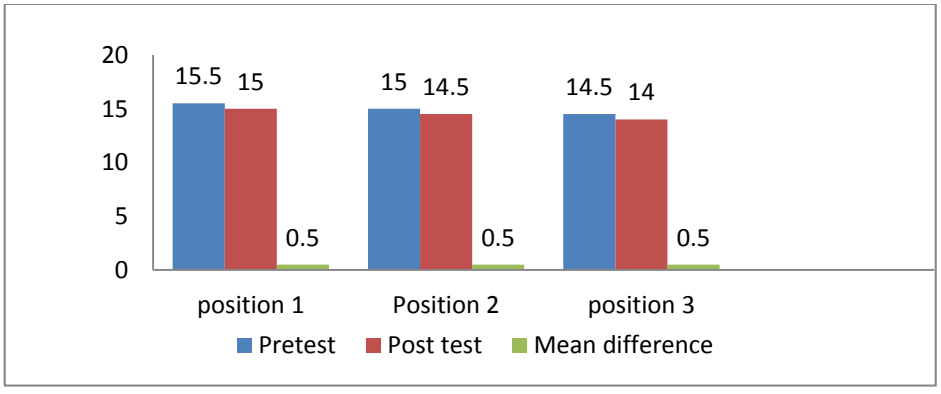


Figure 8: Graphical Presentation of pre-test and Post- test mean value of Dynamic scapular stability in all 3 positions among group B

Table: 7

The table shows the mean value, mean difference, standard deviation and unpaired 't' value of Dynamic scapular stability between Group A and Group B.

Sl. No	Groups	Improvement		Standard deviation	Un paired 't' test
		Mean	Mean Difference		
1	Group-A				
	P1	1.9		0.53	2.27
	P2	1	1.4		
	P3	1.5		0.40	2.95
	Group-B		0.5		
2	P1	0.5		0.38	1.71
	P2	0.5	1.2		
	P3	0.3			

*0.005 level of significance

The calculated unpaired 't' values are 2.27, 2.95 and, 1.71 and the't' table value is 1.610 at 0.005 level of significance. Since the calculated 't' values are more than 't' table value, it shows that there is significant difference in Dynamic scapular stability between scapular PNF techniques along with conventional physiotherapy and conventional physiotherapy with exercises among subjects with Adhesive capsulitis

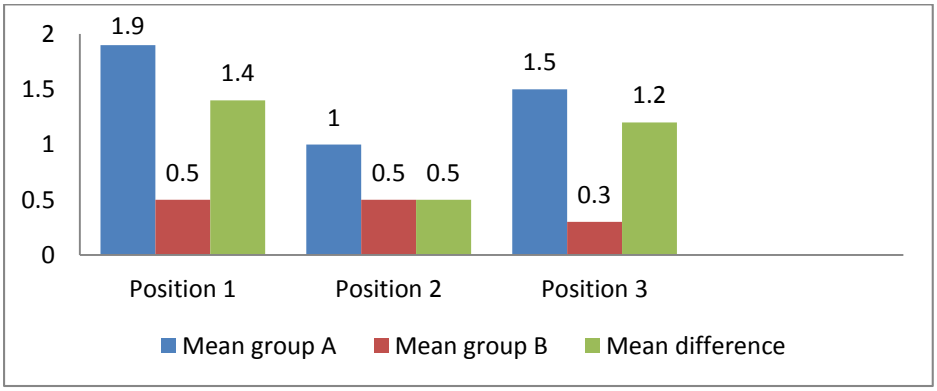


Figure 9: Graphical presentation of pre-test and post-test mean value of Dynamic scapular stability in Group A and B

4.2 RESULTS

20 subjects with Adhesive capsulitis were selected for the study. The subjects were randomly divided into 2 equal groups, group A and group B. For Group A, Scapular PNF technique along with Conventional Physiotherapy (IFT) were given in massed practice form and for group B, conventional physiotherapy with exercises were given.

Both group A and group B subjects were treated for 4 weeks

Analysis of Dependent Variable Shoulder pain in Group A: The calculated 't' value is 16.76 and 't' table value is 3.250 at 0.005 level of significance. Since the calculated 't' value is more than the 't' table value, it concludes that there is significant difference in pain following scapular PNF technique along with IFT among subjects with adhesive capsulitis .

.**Analysis of Dependent Variable Shoulder pain in Group B:** The calculated 't' value is 9.71 and the 't' table value is 3.250 at 0.005 level of significance. Since the calculated 't' value is more than 't' table value, it shows that there is significant difference in pain following conventional physiotherapy with exercises among subjects with adhesive capsulitis.

Analysis of Dependent Variable Pain between Group A and Group B: The calculated 't' value is 3.83 and the 't' table value is 2.878 at 0.005 level of significance. Since the calculated 't' value is more than 't' table value, it shows that there is significant difference between scapular PNF technique along with IFTand conventional physiotherapy with exercises in the management of pain among subjects with adhesive capsulitis .

Analysis of Dependent Variable Dynamic scapular stability in Group A: The calculated 't' value of position 1 , 2 and 3 are 11.08, 9.11 , and 10.38 respectively and 't' table value is 3.250 at 0.005 level of significance. Since the calculated 't' values are more than the 't' table value, it concludes that there is significant difference in dynamic scapular stability following scapular PNF techniques along with IFT among subjects with adhesive capsulitis

Analysis of Dependent Variable Dynamic scapular stability in Group B: The calculated 't' value of position 1 , 2 and 3 are 9.05, 10.08 , and 8.05 respectively and 't' table value is 3.250 at 0.005 level of significance. Since the calculated 't' values are more than the 't' table value, it concludes that there is significant difference in dynamic scapular stability following Conventional Physiotherapy with exercises among subjects with adhesive capsulitis

Analysis of Dependent Variable Dynamic scapular stability between Group A and Group B: The calculated 't' values are 2.27, 2.95 and 1.71 respectively and the 't' table value is 1.610 at 0.005 level of significance. Since the calculated 't' values are more than 't' table value, it shows that there is significant difference in Dynamic scapular stability between scapular PNF techniques along with Conventional Physiotherapy and conventional physiotherapy with exercises among subjects with Adhesive capsulitis.

When comparing the mean values of Group A and B, Group A shows more difference than Group B. Hence, it is concluded that scapular PNF techniques along with Conventional Physiotherapy is more effective than conventional physiotherapy with exercises in improving Dynamic scapular stability and reduction of pain in subjects with adhesive capsulitis.

V DISCUSSION

The study was conducted in 20 subjects. The subjects were divided into 2 groups. Group A received Scapular PNF techniques along with Conventional Physiotherapy(IFT)and Group B with conventional physiotherapy (IFT) with exercises.

The study aimed on comparing the efficacy of Scapular PNF techniques and conventional physiotherapy on pain and Dynamic scapular stability among subjects with Adhesive capsulitis.

Adhesive capsulitis (AC), is an insidious painful condition of the shoulder persisting more than 3 months. This inflammatory condition that causes fibrosis of the glenohumeral joint capsule is accompanied by gradually progressive stiffness and significant restriction of range of motion (typically external rotation). However, the patients may develop symptoms suddenly and have a slow recovery phase. **Mezia *et al*., (2014)**

Alaca *et al*., (2011) - Conducted the study on 30 patients and they were randomly assigned to two groups. In addition to the standard rehabilitation program the PNF group received proprioceptive neuromuscular facilitation techniques 10 repetitions and the rest period is 10 seconds and the other group received shoulder exercises .Administration of PNF resulted in earlier functional gains in patients with shoulder syndrome.

From the results it is evident that Group A subjects had improvement in pain and scapular stability following Scapular PNF technique along with Conventional Physiotherapy(IFT). The calculated paired ‘t’ value for Group A is 16.57 which is

greater than the table 't' value ie 3.250 at 0.005 level of significance. This indicates Scapular PNF techniques with IFT is effective in reducing shoulder pain. This is supported by **Park *et al*., (2013)** and **Alaca *et al*., (2011)** .

Bertoft *et al*., (1999) did a study to compare the effect of enhanced versus limited Therapeutic Alliance on pain intensity and muscle pain sensitivity in patients with Shoulder pain receiving active interferential current therapy (IFC). 117 participants were randomly divided into 4 groups. He concluded that IFC appears to lead to clinically meaningful improvements in outcomes when treating patients with Persistant Shoulder Pain.

Stenstrom *et al., (*2007) evaluated a home exercise program in the management of patients with shoulder pain. In this case the program lasted for 6 weeks and was followed up after an additional 4 weeks. . Relatively short durations of exercise (15 minutes per day) appear to result in significant improvements in pain and function

As per the result it is evident that Group B subjects had improvement in pain following conventional physiotherapy (IFT) with exercises. The calculated paired 't' value for Group B is 9.71 which is greater than the table 't' value ie 3.250 at 0.005 level of significance. This indicates conventional physiotherapy with exercises are effective in reducing Shoulder pain This is supported by **Correa *et al.,* (2013) and Manske, *et al.,* (2008).**

Gulsen *et al*., (2016) The aim of our study was to compare the initial effects of scapular proprioceptive neuromuscular facilitation techniques and classic exercise interventions with physiotherapy modalities on pain, scapular position , range

of motion, and function in adhesive capsulitis. Fifty-three subjects were allocated to 2groups: scapular proprioceptive neuromuscular facilitation exercies and physiotherapy modalities and classic exercise and physiotherapy modalities,. The intervention was applied in 3 - 4 sessions in one week. The patients were treated for 4 weeks. . Both groups showed significant differences in shoulder range of motion .. Proprioceptive neuromuscular facilitation, exercise, and physiotherapy modalities had immediate effects on adhesive capsulitis in our study

From the results it is evident that group A subjects had improvement in Dynamic scapular stability following Scapular PNF techniques along with conventional physiotherapy (IFT). The calculated paired 't' value for Group A are 11.08 ,9.11 , 10.38 which is greater than the table 't' value i.e. 3.250 at 0.005 level of significance. Hence Scapular PNF techniques is effective in Dynamic scapular stability and pain. This is supported **by Park *et al*.,(2013).**

Evan *et al.,* (2009) conducted a study with 80 patients with Adhesive capsulitis shoulder and completed 6 sessions of Interferential therapy and stretching exercises twice weekly for 3 weeks. Patient outcome was classified at the end of treatment based on the perceived recovery. He concluded that patients with Adhesive capsulitis shoulder had dramatic improvement with Interferential therapy and stretching exercises.

From the results it is evident that Group B subjects had improvement in Dynamic scapular stability following conventional physiotherapy with exercises. The calculated paired't' values for Group B are 9.05 , 10.08 , 8.05 which is greater than the table 't' value i.e. 3.250 at 0.005 level of significance. This states that Conventional Physiotherapy with exercises are effective in Dynamic scapular stability and shoulder pain.This is supported by **Alaca *et al*.,(2011)**

Here the pain is relieved based on the pain gate theory. the short duration pulses at a frequency of 100hz may stimulate the large diameter Ab fibers,which have an effect on the pain gate inthe posterior horn,that inhibit transmission of small diameter nociceptive traffic (C and Ad fibers),which effectively closes the gate to painful impulses. **Melzack and Wall (1965)**

PNF technique helps to develop scapular muscles strength and endurence , facilitate stabiity , mobility , Neuro muscular control , and co ordinated movements. Thereby scapula returned to its normal position and mechanics which was alered due to dysfunction. The scapular muscles dynamically position the glenoid so that efficient gleno humeral movement can occur. . **Paine etal.,(1993)**

In this study, the comparison of Scapular PNF techniques and conventional physiotherapy is done. Scapular PNF techniques are are mainly focused to train the Scapular muscles, have been shown to reduce pain and improve Dynamic scapular stability with promising results. More specifically, clinical trials that included, the Scapular PNF techniques along with IFT have demonstrated that effectively reduces pain and improve Dynamic scapular stability. This comparative study shows that Group A treated with Scapular PNF techniques along with Conventional Physiotherapy(IFT) in treating patients with Adhesive capsulitis in the management of pain and dynamic scapular stability than group B treated with conventional physiotherapy with exercises. The Group A is found to be more effective than Group B.

Hence the hypothesis 1and 2 are rejected and 3 is accepted.

VI CONCLUSION

A study was conducted to investigate the efficacy of Scapular PNF technique and conventional physiotherapy with exercises on pain and Dynamic stability of scapula among Adhesive capsulitis subjects.

20 subjects with Adhesive capsulitis were included in this study and randomly assigned into two groups A and B. Each group consisting of 10 subjects. Group A subjects were treated with scapular PNF technique and Conventional Physiotherapy (IFT). Group B with conventional physiotherapy (IFT) and exercises. Shoulder pain and Dynamic scapular stability were assessed before and after the intervention by Numerical pain rating scale (NPRS) and Lateral scapular slide test respectively.

The result is showed that Scapular PNF technique along with Conventional Physiotherapy is effective in reducing Shoulder pain and improving Dynamic scapular stability. When comparing conventional physiotherapy with exercises on pain among Adhesive capsulitis the statistical result showed that there was significance difference between both the groups, but when analyzing mean difference of both groups, Group A received Scapular PNF techniques along with conventional physiotherapy showed more difference than Group B.

When comparing Scapular PNF technique with conventional physiotherapy and conventional physiotherapy with exercises on Dynamic scapular stability, the statistical result showed that there was significant difference between both the groups. When analyzing mean difference of both groups, group A received Scapular PNF techniques along with conventional physiotherapy showed more difference than group B.

Hence we can conclude that Scapular PNF technique along with conventional physiotherapy(IFT) were found to be more effective than conventional physiotherapy with exercises in reducing pain and improving Dynamic scapular stability among Adhesive capsulitis subjects.

5. 1 Limitations

- This study is having small sample size.
- Short term study.
- Only Adhesive capsulitis subjects were selected.
- Occupations are not considered.
- Treatment duration is only about 4 weeks.

5.2 Suggestions

- This study can extend to a large sample size and can include other age groups
- Study can be done in different variables.
- Treatment duration can be extended.

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VIII ANNEXURES

Annexure I

PHYSIOTHERAPY ASSESSMENT CHART

I. Subjective Examination

a. Name :

b. Age : Years :

c. Sex : M / F :

d. Occupation :

e. History collection :

f. Present Medical history :

g. Past Medical history :

II. Objective Examination

A) On observation

1. General body weight :

2. Musculature :

3. Deformity :

4. Tropic changes :

5. External appliances :

B) On palpation

1. Temperature :

2. Swelling :

3. Local tenderness :

4. Oedema :

5. Muscle spasm :

C) On examination

1. Pain assessment (NPRS) :

1. Onset :

2. Duration :

3. Site :

4. Type :

5. Nature :

6. Aggravating factor :

7. Reliving factor :

1. Muscle power assessment
2. Sensory examination

    a. Superficial sensation

    b. Deep sensation

    c. Combined cortical sensation

Diagnosis

Specific assessment

- Numerical Pain rating scale
- Lateral scapular slide test

Annexure II

Special test

Lateral scapular slide test

Patient position - Standing

Therapist position - standing

Procedure

The examiners measured the distance from the T7 spinous process to inferior angle of scapula in all three arm positions; this linear distance was defined as the scapular index

- The first position was of the arm relaxed at the sides (0° of shoulder abduction).
- The second was the subject's hand around the waist with the web space between the thumb and second finger placed on the lateral iliac crest (45° of shoulder abduction);
- The third was with the arm abducted at 90° and in full internal rotation.

Annexure – III

Table 8: Pre and post-test values of pain in Group A

Sl. No	Pre test	Post test
1	7	3
2	5	3
3	6	3
4	6	2
5	7	2
6	7	4
7	5	1
8	5	2
9	7	2
10	6	3

Table 9: Pre and post-test values of pain in Group B

Sl. No	Pre test	Post test
1	7	5
2	7	5
3	7	6
4	6	3
5	6	4
6	7	5
7	7	5
8	7	5
9	6	4
10	6	6

Annexure IV

Table 10: Pretest values of Dynamic scapular stability (In centimeters) in Group A

Sl no.	**Pre test**					
	Position 1		Position 2		Position 3	
	Affected	Unaffected	Affected	Unaffected	Affected	Unaffected
1	16	14	16	14	15	14
2	14.5	13	14.5	13	15	13
3	15	14	15	14	15	14
4	14	12	14.5	12	14.5	12
5	14.5	13	15	13	14.5	13
6	15	14	15	14	15	14
7	15	13	14.5	13	15	13
8	14.5	13	14	13	14.5	13
9	15	14	15	14	15	14
10	15.5	14	15.5	14	15.5	14

Table 11: post-test values of Dynamic scapular stability (In centimeters) in Group A

Sl no.	**Post test**					
	Position 1		Position 2		Position 3	
	Affected	Unaffected	Affected	Unaffected	Affected	Unaffected
1	14	14	15	14	14.5	14
2	13.5	13	13.5	13	14	13
3	14.5	14	13	14	15.5	14
4	13	12	13.5	12	13.5	12
5	13	13	12	13	14	13
6	14.5	14	14.5	14	13.5	14
7	14	13	13.5	13	14	13
8	13.5	13	14	13	14	13
9	14.5	14	14.5	14	14.5	14
10	14.5	14	14	14	14.5	14

Table 12: Pre test values of Dynamic scapular stability (In centimeters) in Group B

Sl no.	Pre test					
	Position 1		Position 2		Position 3	
	Affected	Unaffected	Affected	Unaffected	Affected	Unaffected
1	15.5	14	16	14	15.5	14
2	15	13	15	13	15	13
3	15	13.5	15.5	13.5	15	13.5
4	16	14	16.5	14	16	14
5	14	12.5	14	12.5	14	12.5
6	15	13	15.5	13	15	13
7	15	13	15	13	15.5	13
8	16	14	16	14	16.5	14
9	16	14.5	16	14.5	16	14.5
10	15	14	15.5	14	15.5	14

Table 13: post-test values of Dynamic scapular stability (In centimeters) in Group B

Sl no.	Post test					
	Position 1		Position 2		Position 3	
	Affected	Unaffected	Affected	Unaffected	Affected	Unaffected
1	15	14	15	14	14.5	14
2	14	13	14.5	13	14	13
3	14.5	13.5	14	13.5	14	13.5
4	15	14	14.5	14	15	14
5	13	12.5	13	12.5	13.5	12.5
6	14	13	14	13	14.5	13
7	14	13	14	13	14	13
8	15	14	15	14	14.5	14
9	15.5	14.5	15	14.5	15.5	14.5
10	14	14	14.5	14	14.5	14

ANNEXURE V

PATIENT CONSENT FORM

I . . . . . Voluntarily consent to participate in the research named **"A COMPARATIVE STUDY ON THE EFFICACY OF SCAPULAR PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION TECHNIQUE AND CONVENTIONAL PHYSIOTHERAPY (IFT AND EXERCISES) ON PAIN AND DYNAMIC SCAPULAR STABILITY AMONG SUBJECTS WITH ADHESIVE CAPSULITIS".**

The researcher has explained me the treatment approach in brief, risk of participation and has answered the questions related to the study to my satisfaction.

Signature of patient Signature of researcher

Signature of witness

Date:

Place: